

ABSTRACT

A miniaturized, optically driven therapeutic radiation source operates at significantly reduced power levels. The apparatus includes a laser-driven thermionic cathode, a target element, a probe assembly, and a laser source. The probe assembly includes an optical delivery structure, such as a fiber optic cable, that directs a laser beam from the laser source to impinge upon a surface of the thermionic cathode, heating the surface to a temperature sufficient to cause thermionic emission of electrons. The emitted electrons form an electron beam along a beam path. The target element is positioned in the beam path, and includes means for emitting therapeutic radiation, such as x-rays, in response to incident accelerated electrons from the electron beam. Reflector elements may be included to reflect unabsorbed laser radiation back to the thermionic cathode.